

## Chapter

# REFLEXOLOGY - SCIENCE OR BELIEF

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## ABSTRACT

The use of complementary and alternative therapies, even in western industrialised countries with well developed conventional health care systems, ranges from 10-52%. Annual expenditure on complementary and alternative medicine (CAM) in the UK alone is estimated to be in excess of £1.6 billion. Despite this extensive use, complementary and alternative therapies have recently come under scrutiny in terms of their safety and efficacy, particularly in relation to claims made by practitioners. To date, robust scientific evidence for health benefit has been lacking for many alternative therapies, but despite this they remain popular.

Reflexology therapy is a form of sophisticated manual pressure applied most typically to the feet. It is one of the top six complementary and alternative therapies purchased. It is distinct from general massage due to two key therapeutic claims. First, that distinct areas on the feet correspond to specific internal organs within the body. Second, that massage to these discreet areas affects the haemodynamic status of the referred or ‘mapped’ organs in the body.

This chapter will describe and discuss in detail the basis for these haemodynamic theories by reviewing the original work of William H Fitzgerald and Eunice Ingham. The chapter will finish by describing the available contemporary evidence to support these theories and discusses the challenge of proving specific treatment effects in CAM in this current era of evidence-based medicine.

## INTRODUCTION

Reflexology is a complex massage intervention, based on the idea that specific areas on the soles of the feet (called reflex points), correspond or ‘map’ to individual internal organs in the body. Each organ is represented by a unique reflex point [1]. Reflexologists learn the

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location of these points from reflexology foot maps or charts. Eunice Ingham invented the concept of reflexology in the 1930's and since then, it has gone on to become a hugely popular form of complementary therapy. Ingham made the claim that the application of reflexology massage to reflex points on the feet increases blood supply to the corresponding mapped organs in the body [2]. In her teachings, the reflexology haemodynamic treatment-related effect is thought to be distinct from non-specific foot massage components, such as simple touch, therapeutic exchange and placebo effects, even though these components can themselves cause haemodynamic responses [3-6].

Ingham's idea of a two-way relationship between specific points or areas of the feet and the organs of the body continues to dominate contemporary reflexology practice through the curriculum of the International Institute of Reflexology. This training organisation is the largest global provider of reflexology training and offers training based exclusively and explicitly on Ingham's theories [7]. The IIR deliver their training courses through 11 global franchised training branches [8] and claim to have at trained 25,000 reflexologists worldwide [9]. They remain the largest UK reflexology training provider [10].

Worldwide expenditure on CAM is estimated to be at least \$40 billion per annum [11], with £1.6 billion spent annually in the UK alone [12;13]. Reflexology enjoys considerable public investment, particularly in Norway [14], Denmark [15] and the UK [12;16], where it is in the top six CAM therapies purchased. Individual reflexology sessions can cost from £15 (€18) - £70 (€84) per treatment and typically, 6-8 sessions are usually recommended by therapists to in order to gain the optimal therapeutic results [17;18]. Therefore the cost of an eight-week series could easily be in excess of £400 (€480) if an average of £50 (€60) per session is paid. Costs of up to £1000 (€1195) per year for repeated blocks of treatment may not be unusual for a patient with chronic health issues [19].

Due to this public-driven investment, reflexology safety and product quality have become healthcare research priorities [20], particularly in relation to the unique therapeutic claim of a specific haemodynamic effect. Any therapy that makes such a definable (and testable) prediction as this should be available to provide evidence to demonstrate that the product delivers as claimed and if it does, that the specific effect is safe and effective for all its users. This is particularly true for patient groups who may potentially be at risk from adverse treatment-related effects [21]. General adverse effects may include both intrinsic safety issues such as treatment errors or contraindications and extrinsic quality issues such as poor standardisation or quality control of the treatment delivered [20]. In the case of reflexology, if there is a significant specific haemodynamic effect, this raises particular questions about the intrinsic safety of the therapy for patients who may be adversely affected by an unanticipated change in haemodynamic status, such as those with heart disease [22]. Some cardiologists have voiced concerns that cardiovascular disease patients may be particularly vulnerable to the effects of CAM in general due to drug interaction, reduced adherence to conventional therapies or potential adverse effects amplified by the lack of CAM product standardisation [22]. An example of such an effect in relation to reflexology would be an arbitrary reflexology-induced change in haemodynamic status, which may be beneficial, but may also have an adverse effect.

To date, not one published reflexology research experiment has recruited from the cardiac patient population, so its effect on this patient group is unknown. Furthermore, only a few reflexology studies have controlled for non-specific effects in order to isolate any specific active component, despite the haemodynamic claim being a key part of the therapeutic value

of reflexology. Thus, some doubt must remain over the validity of the haemodynamic claim. Furthermore, reflexology literature and teaching are inconsistent on the subject of the appropriateness of reflexology for cardiac patients. 'Heart or circulatory problems' are described as both an indication [23;24] and as a contraindication where treatment should be avoided [25-28]. It is reported that the haemodynamic effect of reflexology can adversely stress the cardiovascular system and potentially affect patients with mechanical implants such as pacemakers and artificial heart valves [29]. There is also a lack of consensus in the contemporary reflexology teaching literature about whether treatment to the heart reflex point itself carries with it the risk of a potential adverse-specific treatment effect, particularly for cardiac patients.

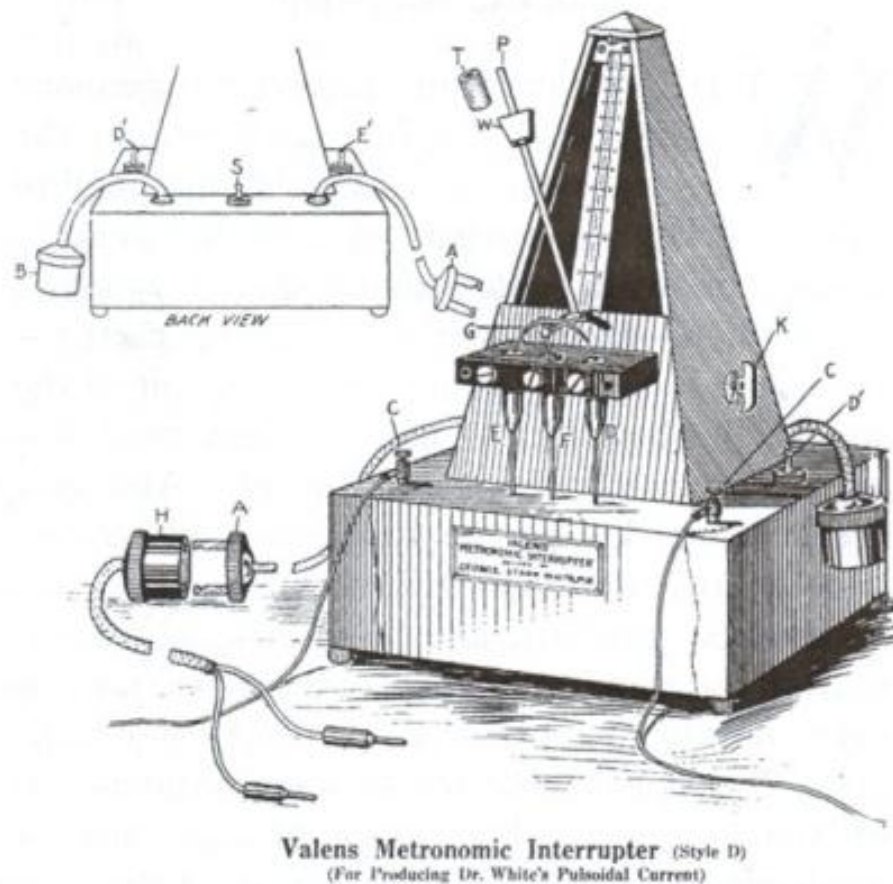
Despite its international popularity, Reflexology is a relatively recent therapeutic invention, which makes it unusual in CAM terms. Most CAM therapies are based on traditional beliefs, theories and cultural meaning of various indigenous populations, most typically Asian, African or Eastern, and have been used in these communities often for thousands of years [30]. Whereas the first documented appearance of the theory that provided the foundation for reflexology appeared relatively recently, its novel concepts detailed in two books, published in early twentieth century America. This recent history allows a unique opportunity to examine the therapeutic claims right from inception to present, in order to determine the quality of consistency of its historical narrative. Also, to more fully understand the exact nature of its inventors claims and to identify what component of the reflexology haemodynamic claim is experimentally falsifiable from within its own construct. This is possible because the entire foundational theory of contemporary reflexology is based purely on the therapeutic assumptions of two early twentieth century American healthcare professionals, Dr William Fitzgerald and physiotherapist Eunice Ingham.

This chapter will analyse these two historical texts and compare the theories and claims of the two authors with more recent reflexology literature. The comparative analysis between its foundational theories and contemporary interpretations will have a particular focus on the inconsistent reflexology opinions regarding the appropriateness of treatment for cardiac patients, in order to identify if there is any common framework that exists in the reflexology narrative. The chapter will conclude by discussing the significant methodological challenges facing researchers who aim to investigate the acute (immediate) haemodynamic effects of reflexology in cardiac patients and describe the methods we used in an attempt to overcome these challenges.

## **THE HISTORICAL ORIGINS OF REFLEXOLOGY AND ITS CLAIM OF A SPECIFIC HAEMODYNAMIC EFFECT**

The entire foundational theory of contemporary reflexology is based on the therapeutic assumptions of two early twentieth century American healthcare professionals, Dr William Fitzgerald and physiotherapist Eunice Ingham.

## Zone Therapy – For doctors only 185

**DR. WILLIAM H. FITZGERALD**

Dr William H Fitzgerald was the originator of the distinct theory that forms the basis for modern-day reflexology. He was an early twentieth century graduate of the Medical School of University of Vermont and worked as a surgeon in Boston City hospital, Central London Nose and Throat Hospital and as an otologist in Vienna [26]. Fitzgerald's medical training should have given him some awareness of the conditions necessary to scientifically justify claims of knowledge beyond observational induction, as concepts of deductive reasoning, statistics, inference, and blinded, controlled randomised experiments had already been well formulated by scientists such as Newton, Hume and Peirce [33].

**FITZGERALD'S HYPOTHESIS**

In 1912, during his tenure as head and surgeon of the Nose and Throat Department of St Francis Hospital in Hartford, Connecticut, Fitzgerald claimed to have accidentally discovered that pressure on the muco-cutaneous margin (where the skin joins the mucus membrane of the nose) – resulted in an anaesthetic effect as powerful as cocaine. As this simple action seemed to him to yield extraordinary results, he spent the next six years experimenting further, applying various forms of pressure to external peripheral areas all over the human body [31;32]. This experimentation led him to devise a theory about how certain aspects of the human body worked. Fitzgerald's ideas were based on his clinical observations of human reflex responses to pain or emotional distress. He interpreted unconscious reflex actions such as the gritting of teeth when in pain, claspings of an injured limb, gripping of a chair when frightened or in agony, the clenching the fists when in a state of anger and the claspings of hands when emotionally bereft, as signs that humans display a native involuntary urge to apply external pressure on the skin in times of pain, with the aim of producing an innate analgesic effect [33]. Based on these observations, Fitzgerald proposed that the human automatic response to pain stimulus was specifically designed to stimulate a natural condition of anaesthesia within the body [34]. After further experimentation, he hypothesised that sustained and directed (non-accidental) pressure on distinct external areas of the human body also 'cured' various forms of underlying illness or disease in the internal body region below [35-41]. He defined this new theory as "a science" and named it Zone Therapy [33].

## OUTLINE FOR STRUCTURAL ANALYSIS

### The Conceptual Claims

Fitzgerald's theory proposes that the body is divided into ten longitudinal zone areas (Figure 1.1) and its effectiveness is based on certain assumptions. [32,33]

1. There are five zones on either side of a central median line which run down the middle of the body
2. Each zone related to the relevant fingers and toes of the body. The outer-most zone encompasses the thumb, extends up the arm through to the head and down to the greater toe. The second zone relates to the second finger and second toe using the same vertical longitudinal shape and so on
3. Each zone is of equal width
4. The tongue is also divided into ten zones, with the dorsal (top) surface corresponding to the anterior (front) sections of the body zones and the tongue as a whole, corresponding to the zones throughout the body
5. The hard and soft palate and posterior walls of the pharynx and epipharynx are divided in the same way
6. All body parts found in each zone are interlinked, which means that pain or disease in any one part potentially affects the rest of the zone
7. The teeth reflect the innermost parts of every bone in the body and to a lesser extent, the tissues within all body zones, therefore all bones and related tissues in the body are reflected in the teeth

8. Any inflammatory processes or injury on the periphery of the body such as the teeth, fingers or toes may excite, or be responsible for, disease or inflammation throughout any part of the internal related zone
9. Any internal inflammatory disease processes within a given zone may be responsible for peripheral inflammatory imbalances or symptoms in the teeth, fingers, toes or tongue.

Based on these assumptions, his theory predicts the following causal links between the considered application of pressure, and changes in the human condition, that are not normally biologically and causally linked with direct (non-accidental) pressure [33;34;42;43]:

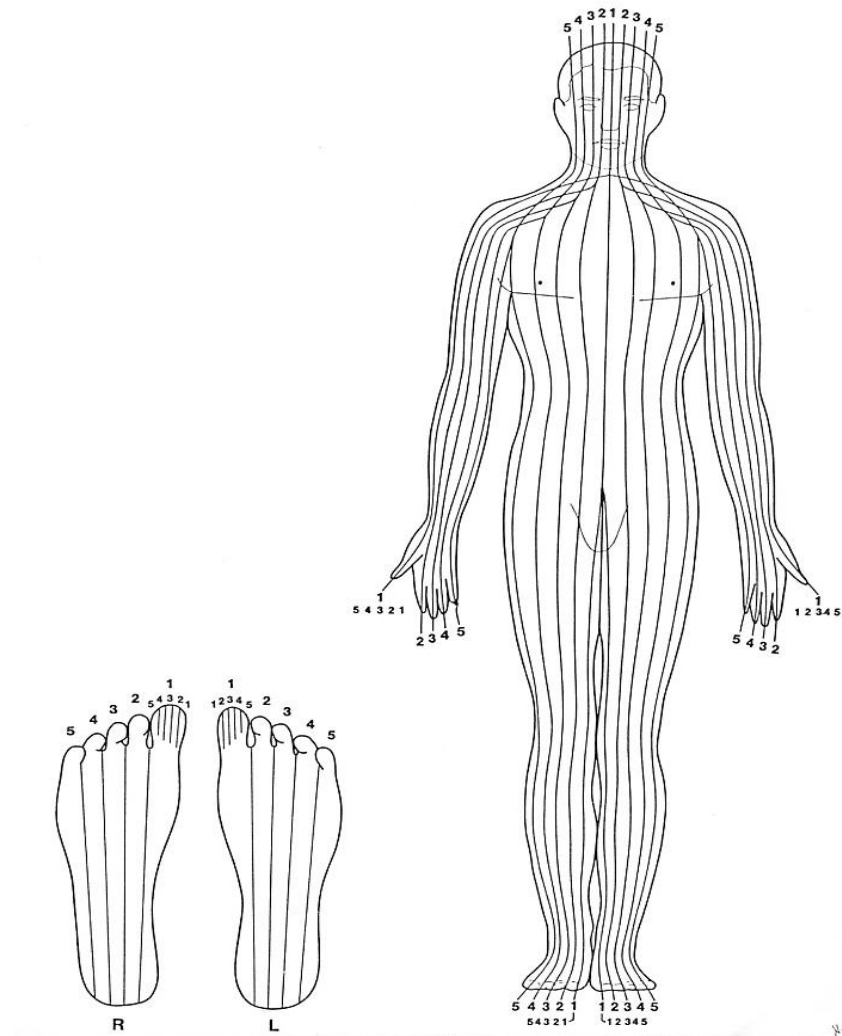


Figure 1. Fitzgerald's conceptual model - the body is divided into ten longitudinal zone areas.

- a. The conscious application of a sustained, direct (non-accidental) pressure to external accessible area of each zone will specifically affect all inaccessible inner body parts in the same zone

- b. Following the application of sustained (non-accidental) pressure on an external part of a zone, a form of natural endogenous analgesia will occur within the corresponding internal regions of the corresponding zone
- c. If the pressure is applied firmly enough and for long enough, it produces a condition of anaesthesia more potent than opiates, therefore can be used in place of anaesthetic to induce a pain-free state in which minor surgical operations can be successfully carried out
- d. Applied pressure will also cause lymphatic relaxation and result in the lymph being stimulated to flow normally in its channels
- e. The correct application of zone therapy will not only relieve pain, but will often remove the cause of the pain, regardless of underlying pathology
- f. Therefore the application of direct (non-accidental) pressure is never arbitrary or harmful, it is always therapeutically beneficial.

Making the deaf hear 59

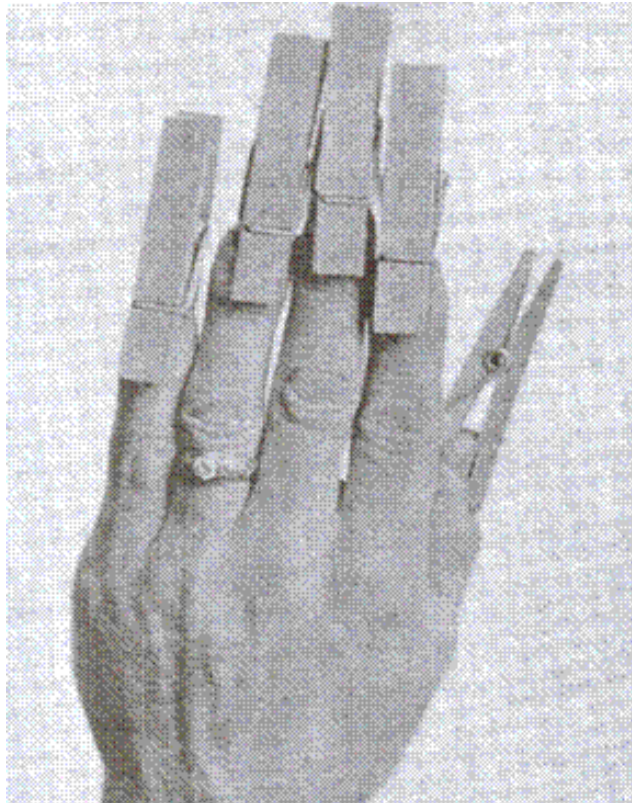


Figure 2. Adapted, hollowed-out clothes pegs used to apply pressure to the fingers for the relief of pain, to desensitise the teeth for dental operations, and to make the deaf hear.

### Mode of Activation

Fitzgerald developed a variety of tools to apply the correct 'dosage' of external pressure on various periphery of the body. Pressure was reportedly applied from one-half minute to up

to four minutes on average and recommended to be as deep and firm as the receiver could bear it [33]. The instruments he used ranged from clothes pegs or elastic bands wrapped tight around the finger tips (Figure 2), metal combs grasped tightly in a clenched hand, nasal probes pressed inside the nasal cavity or probes firmly pressed upon the surface of the tongue or soft palate (Figure 3). Distinct peripheral areas were selected for treatment in relation to their proximity to the condition or disease in the underlying corresponding zone. Other times, areas were identified if they were deemed to be presenting localised symptoms that had manifested from internal disease in the corresponding zone. In particular, as the tongue and teeth were regarded as being able to affect or reflect the innermost parts of all zones, prolonged teeth clamping or tongue compression was often advised, in fact Fitzgerald devotes an entire chapter of his book for use by dentists [44].

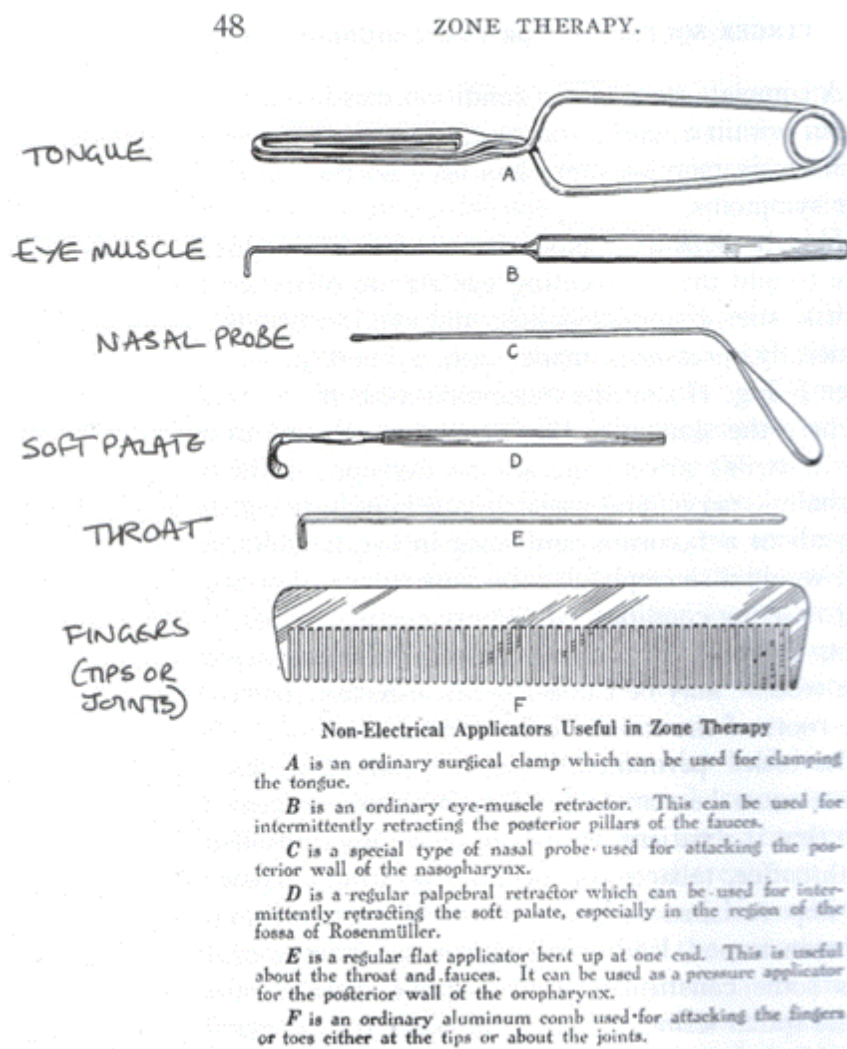


Figure 3. Non-electrical applicators used by Fitzgerald to apply pressure on various peripheral surfaces of the body.



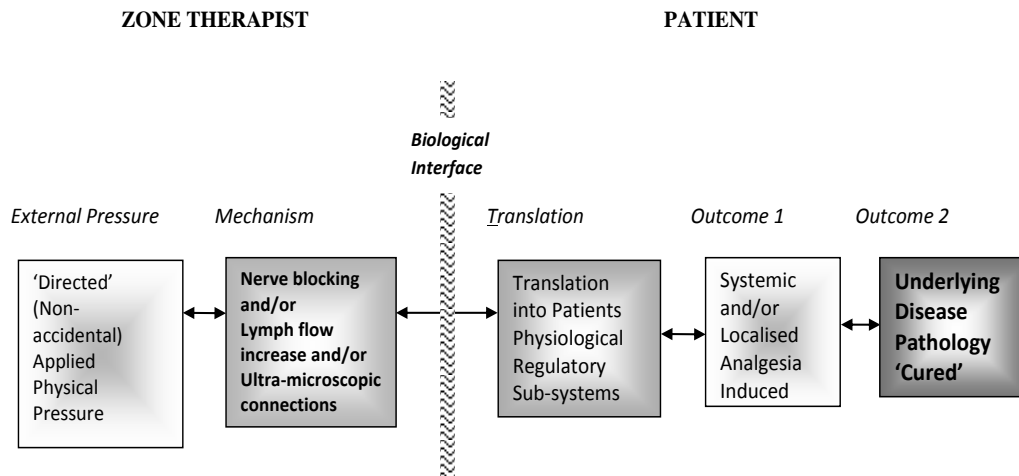


Figure 4. Schematic illustrating Fitzgerald's hypothesised materialist mechanisms of action, operating via a biological interface - interacting with the patient's physiological matter.

## Theories of Causality

In 1917, Fitzgerald and Dr Edwin F Bowers, another zone therapy advocate, published a book of first-hand accounts of case studies entitled "Zone Therapy or Relieving Pain at Home" [45]. Throughout his writing, Fitzgerald speculated about several mechanisms of action to explain his ideas, which can be broadly categorised as either materialist (having physical/biological form) or immaterialist, (appealing to non-material phenomena e.g. healing power of nature).

## Materialist Mechanisms

He considered "blocked shock" or "nerve block" as one potential mechanism and hypothesised that applied pressure to the nerves running from an injured extremity to the brain potentially "*inhibits or prevents the transmission to the brain, the knowledge of injury*" by inducing a state of inhibition in the relevant zone nerve impulses [33]. However the seemingly unrelated locations of applied pressure in some of his case studies seemed to contradict this premise. He also linked zone therapy pressure with lymphatic relaxation and flow stimulation and proposed that many pathological conditions disappeared as a result [33], but it is unclear whether he regarded the stimulation of lymph flow as the key causal agent in treatment-related disease remission. He also speculated briefly about Bowers hypothesis, which suggested the existence of ultra-microscopic connections, analogous to the pathways of the nervous system [34], but this explanation had fundamental flaws, as Fitzgerald offered no biologically plausible explanation as to the means these ultra-microscopic connections might use to interface with the underlying physiology in order to bring about a referred analgesic condition or disease remission state (Figure 4).

Several problems arise from Fitzgerald's materialist theories. First, he gives no logical explanation as to how such profound physiological change can be causally brought into being, purely by the act of directed (non-accidental) pressure to the periphery of the body, other than the volitional intention of the zone therapist for it to do so. Second, he offered no explanation as to how external physical pressure could interface with, or translate to, the internal physiological systems of the human body in order to control the complex involuntary, numerous physiological processes necessary to regulate disease remission or profound states of analgesia to order. And third, he fails to explain how the specific effect arising from applied, distinct external pressure could distinguish random or 'accidental' pressure that is exerted on the body by clothes, close proximity to another, supportive furniture such as chairs, shoes, the ground underneath the feet etc., compared to sustained and directed (non-accidental) applied pressure of zone therapy. Similar problems are also evident in his immaterialist theories of causality.

#### IMMATERIAL TO MATERIAL

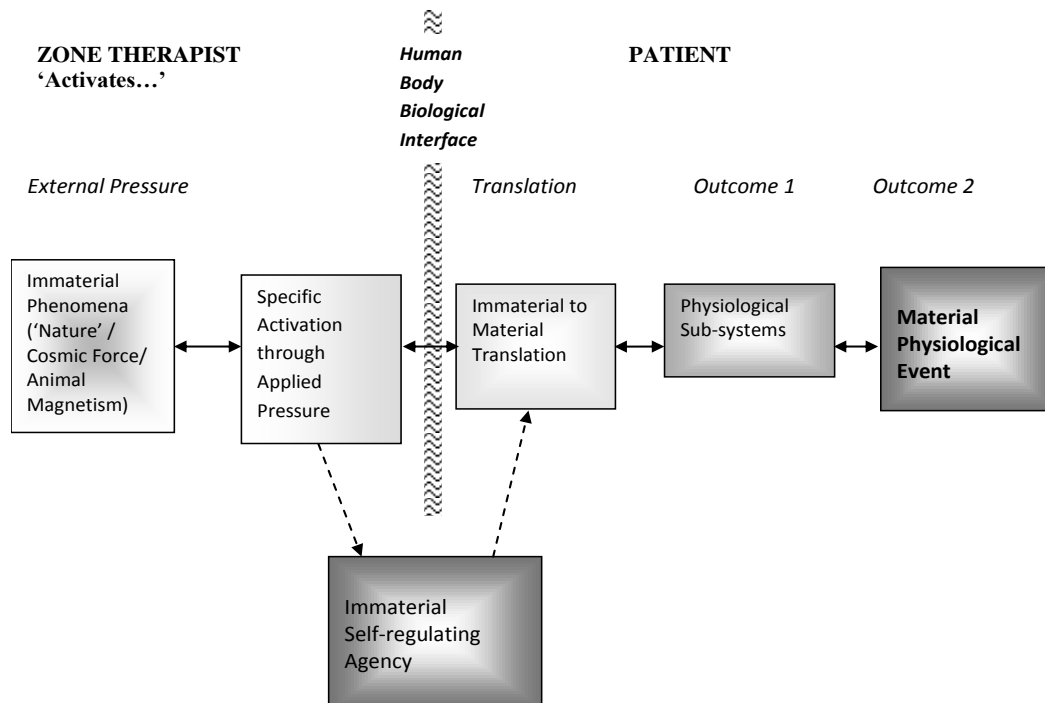


Figure 5. Schematic illustrating Fitzgerald's hypothesised immaterial phenomena of action, operating via unknown interface - interacting with patient's physiological matter.

#### Immaterial Mechanisms

In order to produce complex effects such as disease remission or healing, zone therapy also needed to appeal to immaterial forces such as the healing power of nature, the "*Cosmic Force that envelopes us all in a mantle of kindness and love*" [46] or at other times, the

“*soothing influence of animal magnetism*” [34]. This referred to a supposed magnetic fluid or ethereal medium which was believed to exist inside the bodies of animate (breathing) beings, which could be wilfully manipulated by the careful laying on of hands [47] or in the case of zone therapy, direct (non-accidental) applied pressure [33]. ‘Nature’ or Cosmic Forces, were also seen as an active agents, operating as beneficent organising agencies, capable of restoring the body to full health when stimulated by some form of operator (in this case the therapist applying specific directed pressure). Fitzgerald’s presumption that these unquantifiable forces could be stimulated to act, implied that in his model, ‘Nature’ / Cosmic Forces are somehow malleable but dormant, waiting passively for someone to operationalize either in order to restore normal pathology in the presence of disease. This apparent ambivalent passivity of Nature / Cosmic Forces in the face of underlying disease pathology would seem to be somewhat at odds with Fitzgerald’s notions of these immaterial entities being inherently benevolent, once activated (Figure 5).

Other fundamental problems that applied to his materialist interpretation also apply equally to his notions of immaterialist phenomena. For instance, Fitzgerald gives no explanation as to how these immaterial phenomena interface with, or translate to, material or physical matter in order to control the complex involuntary, numerous physiological processes necessary in order to regulate disease remission to order. Second, he gives no logical explanation as to how these immaterial phenomena can be made manifest purely by the act of directed applied pressure to the periphery of the body. Furthermore, how the immaterial agency distinguishes random or ‘accidental’ pressure that is exerted on the body by clothes, close proximity to another, supportive furniture such as chairs, shoes, the ground underneath the feet etc., compared to directed (non-accidental) applied pressure.

In effect, it appears from his writing that Fitzgerald expected an effect out of zone therapy, and believed he got what he expected. However he appeared to have made no methodological efforts to control for non-specific effects such as suggestibility, placebo, simple regression to the mean, misdiagnosis or spontaneous recovery in his subjects [48], even though the concept of suggestibility in a medical context was already being widely discussed in early twentieth century medical and popular literature

### **Zone Therapy’s Relevance to Specific Haemodynamic Effect Claim and Treatment Strategies for Patients with Heart Disease**

Fitzgerald makes only passing reference to one form of acute cardiovascular event, chest pain, and suggests that if it remains unrelieved by applied zone pressure, the pain is due to abnormal pressure being applied from within the zone itself, such as

“irritation, gas, pus, impactions, or necrosis, all of which demand immediate medical attention” [33].

However there is no mention in Fitzgerald’s writing of a specific haemodynamic effect being causally linked to applied zone therapy pressure treatment. His only reference to any kind of haemodynamic component is non-specific, when he advises against the constriction of blood vessels by “*undue irritation of the nerve zones*” [33] caused by excessive pressure of tight belts, corsets or collars. But he does not distinguish how the effects of abnormal pressure

such as clothing restriction can be distinguished from the proposed beneficial effects of applied zone therapy pressure. Apart from these two brief asides, he offers no case study examples of the treatment of any degree of heart disease in his writing. After publication of his first book, he did not appear to publish further on zone therapy, and there is little evidence of his subsequent activities in the field.

## Eunice Ingham

Eunice Ingham was a physiotherapist in the early 1930's. After learning zone therapy from a student of Fitzgerald's, Ingham made several crucial amendments to its theory and practice and distinguished her version of the therapy by naming it reflexology. She offered no logical justification for these changes, therefore the remodelling of Fitzgerald's zone therapy appeared to be based on personal belief.

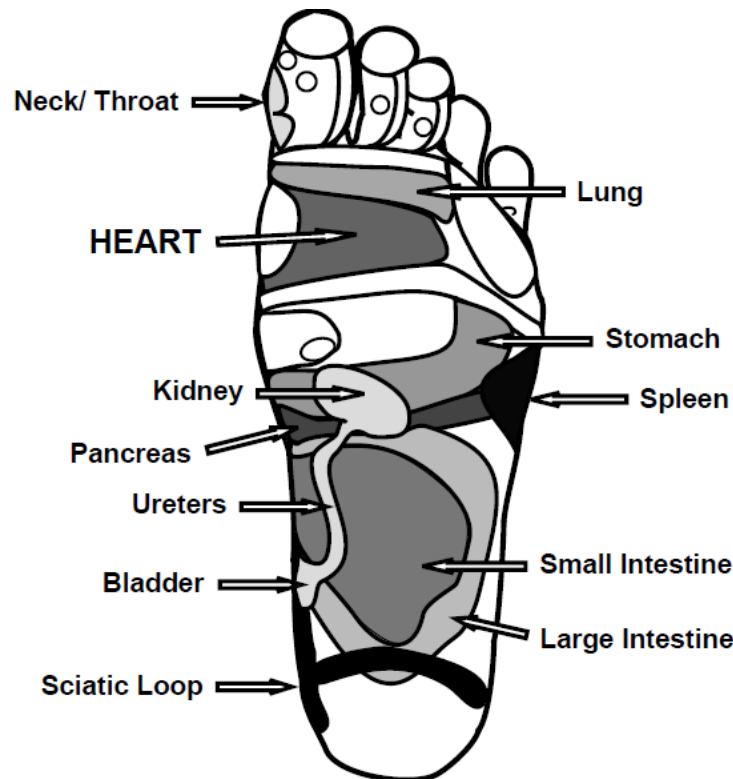


Figure 6. Inghams Reflexology Chart of the feet showing the various organ reflex areas. (Original artwork **David Ditchfield**)

## Ingham's Hypothesis

Ingham made a finite set of observations arising from her own self-reported experimentation with zone therapy and from these results and her own personal beliefs, devised her theory of how the body worked. Ingham decided that the soles of the feet

represent a proportional scaled map of the major organs and internal body parts and this correspondence is biologically fundamental to the design of the human body. Furthermore, she believed there were discrete, two-way feedback loops between each individual organ and corresponding areas on the feet (Figure 6), areas which she labelled as reflex points [49]. For her, reflexology relied on the following assumptions, some shared with Fitzgerald's concept, some entirely distinct to her own model:

## OUTLINE FOR STRUCTURAL ANALYSIS

### The Conceptual Claims

1. There are five zones on either side of a central median line which run down the middle of the body [50]
2. Each zone related to the relevant fingers and toes of the body. The outer-most zone encompasses the thumb, extends up the arm through to the head and down to the greater toe. The second zone relates to the second finger and second toe using the same vertical longitudinal shape and so on [51].
3. Each zone is of equal width [51]
4. The feet are the most sensitive external zone area of the body [31]
5. The feet offer a perfect scaled-down representational model template of the human body, with the toes representing the head, the ball of the foot the upper part of the body, and the heel representing body parts below the waist (Figure 1.9) [51]
6. The precise location of the organ or body part mapping on the soles of the feet represents a collection of unique and individual discrete areas of nerve endings or reflexes in each discrete area [52]
7. The body is constantly in motion, with the "*natural muscular activity of each organ keeping its whole nerve canal free from detrimental obstruction*" [52]
8. Each reflex area therefore corresponds exclusively with its corresponding mapped organ or distal body part in the body via means of a discrete feedback loop [52;53]
9. Aspects of this interconnectedness rely on the "*22 miles of tubing*" that makes up the blood stream and corresponding "*nerve endings*" and capillaries in the feet [54]
10. This blood and reflex interconnectedness allows a diagnostic corresponding representation of disease in the distal organ or body part to manifest in the distinct reflex area of either foot [50;51;55].

Ingham's theory allowed her to propose novel explanations about the cause and nature of ill health, one form originating from the periphery, the other from an internal source; in effect, she proposed a top-down or bottom-up approach to the formation of disease, which can be summarised in the following model-dependant assumptions. First, she theorised that disease could be caused by degenerative muscle weakening of the feet. In this respect, her first theory sees the causal nature of disease being directly related to the condition of the feet, put simply, she saw disease as being caused by a 'foot up' influence [50]:

In this model, as body muscle generally weakens, the feet muscles weaken also. This results in misplaced foot joints. Misplaced joints then place undue pressure on certain nerve

endings. Each discreet nerve ending is part of a unique individual feedback loop with a corresponding or ‘mapped’ individual organ or distal body part. The undue pressure shuts off normal ‘nerve’ and blood supply in the feet, resulting in the circulating blood stream corresponding to the discreet feedback loop between the nerve ending and associated body part becoming blocked or stagnated. This slows down circulation in the discreet feedback loop and allows formation of chemical deposits/toxic waste matter around misplaced foot joints or nerves. The corresponding organ nerves are then affected by the peripheral nerve clogging process. This interruption in the clear circulation of individual feedback loops interferes with the “proper contraction and relaxation” of the corresponding organ, which results in the organ failing to get a sufficient ‘fresh supply of blood’. The feedback loop circulation stagnation or sluggishness means that the referred organ then loses its ability to eliminate waste matter, e.g. Kidneys unable to eliminate uric acid sufficiently. Gravity then forces the waste matter deposits or ‘toxins’ to settle in the feet within the discreet feedback loop around the corresponding nerve reflex area.

Her other notion of disease causality involved ideas of inherited or constitutional organ or body weakness, which in her model, manifests in the feet by causing corresponding imbalances or weakness in the relevant reflex point area [50]. In this theory, any inherited or constitutional weakness in organ or body part results in the organs being unable to perform “*proper contraction and relaxation*” activity [52]. This results in insufficient force of circulation to keep the reflected nerve ending in the associated discreet feedback loop, free of waste matter. Then, as waste matter accumulates in the referred foot area of the circulatory feedback loop, the related organ suffers greater blood circulation loss and increase in toxic waste matter build up.

Based on these assumptions of the origin of disease and foot disorders, Ingham’s theory predicts the following specific relationship between the application of reflexology pressure techniques, and changes in the human condition, that are not normally biologically and causally linked with direct (non-accidental) pressure:

- a. Signs of toxin aggregation in the form of ‘grittiness’ (a sense of ‘crystals’ under the planter skin of the sole of the foot) or tender foot areas evidence a ‘sluggish’ circulation within an individual feedback loop [55]
- b. These crystals suggest either a localised peripheral imbalance, or a state of imbalance in the corresponding reflected body area or organ [55]
- c. By palpating the soles of the feet and massaging these gritty or tender foot areas using touch techniques unique to Ingham’s model, the congestive toxic deposits in the circulating feedback loop will be broken down in the nerve reflex areas, clearing the obstruction [55]
- d. As nerve-endings or reflexes in the feet organs are mapped to referred body parts via ‘nerve canals’ or discreet individual circulatory feedback loops, the circulation to the corresponding organ will improve as a result [55]
- e. The massage dissolves the waste matter so that normal circulation can be restored both to the nerve reflex areas and to the referred organ [55]
- f. “Nature” can then repair whatever may have caused the imbalance in the first place [24]

- g. *“The more of this toxic material the blood contains, the more severe will be the reaction...this is nature’s way of cleaning house and eliminating the poisons from the system”* [55]

## Mode of Activation

Ingham changed the physical touch pressure technique from Fitzgerald’s constant applied pressure to a form of distinct massage-touch techniques unique to reflexology, which she applied most typically to the feet. She described her technique as a *“slow creeping and slight pulling back movement”* [56]. She offered no logical justification for this treatment change in her books therefore the remodelling of Fitzgerald’s techniques appeared to be based on nothing more than personal belief.

## Theory of Causality

Ingham published two books, *“Stories the Feet can Tell”*, in 1938, and *“Stories the Feet Have Told”* in 1951. These books have a seminal position in contemporary reflexology practice and form the core curriculum of the IIR training method [57]. Throughout her writing, Ingham proposed several mechanisms of action, which can be broadly categorised as either materialist (having physical/biological form), or immaterialist, (appealing to non-material phenomena). The mechanisms assumed in both will now be briefly discussed.

### “Stories the Feet Can Tell” (1938)

In this book, it is clear from the very outset that Ingham’s reflexology theory bore little resemblance to Fitzgerald’s original zone therapy model. Although she still referred to the zone model as a viable therapeutic theory for the human body, she hypothesised that it is the feet that most reliably ‘tell the story’ of what is actually going on in the body [50]. This diagnostic capability depended on Ingham’s idea that crystalline deposits or areas of tenderness found on the feet were the means by which ill-health or disease in individual organs generally materialised. She believed that if no tenderness or deposits were found in the heart reflex of a person medically diagnosed with heart disease, then the medical diagnosis was wrong [58]. And although the notion of the reflex points on the feet was a new core component of reflexology, Ingham appeared to arbitrarily change her meaning and usage of the word throughout her writing.

## Material Causes

For material causation, Ingham introduced the idea of accumulating toxic ‘crystalline’ waste matter, which she believed ‘settled’ in the ‘nerve endings’ or reflex point found in the feet [50]. She asserted that as crystals blocked individual areas of peripheral nerve endings, then the associated nerves in the corresponding organ would become clogged, leading to the

‘normal muscular activity’ of the corresponding organ circulation becoming impaired, resulting in deceleration of the circulation of the blood through the affected organ [55]. This proposition was the first appearance of any suggestion of a two-way haemodynamic link in reflexology and appeared to rely on the idea that reflex areas of the feet have distinct feedback loops to individual organs via nerve channels (Figure 7).

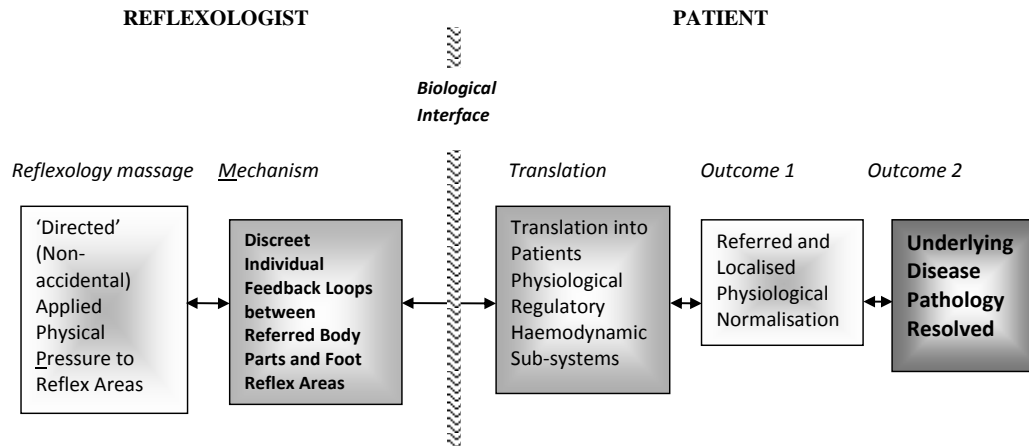


Figure 7. Schematic illustrating Ingham's hypothesised materialist mechanisms of action, operating via a biological interface - interacting with the patient's physiological matter.

Ingham also varied in her explanations of the nature of the crystals of toxic substances that she believed impeded the periphery of these feedback loops, describing them at various times as chemical deposits, poisonous acid, crystalline deposits or toxins [50]. She offered no explanation as to the origins of these toxins or specified the name of a single, identifiable chemical toxin which could be measured or extracted for testing, except for the occasional mention of 'calcium' deposits giving rise to 'acid' crystals [52]. Ingham's idea of 'toxins' is also problematic because any metabolic waste products from the tissues are washed out into the cardiovascular system for eventual filtration and excretion by the kidneys [59], but these metabolic waste products are not generally categorised as 'toxins' and there is no evidence that these materials crystallise and 'settle' in the nerve endings of the feet. So Ingham's idea of toxins arguably has no scientific meaning, even though she stated that the efficacy of reflexology was built on the opinions of practising physicians [60]. Second, if the 'toxins' such as 'acid crystals' settle in the feet due to gravity, then many other metabolic components must also 'settle' in the feet alongside the toxins, which means our feet would contain an inordinate amount of matter or material compared to the rest of the body.

## IMMATERIAL CAUSES

Like Fitzgerald, she also appealed to an intangible agent she describes as 'nature' in her first book [55], which she seemed to regard as some kind of active agent, capable restoring the body to full health, but more so when wilfully stimulated by some form of operator (in this case the therapist) (Figure 8).



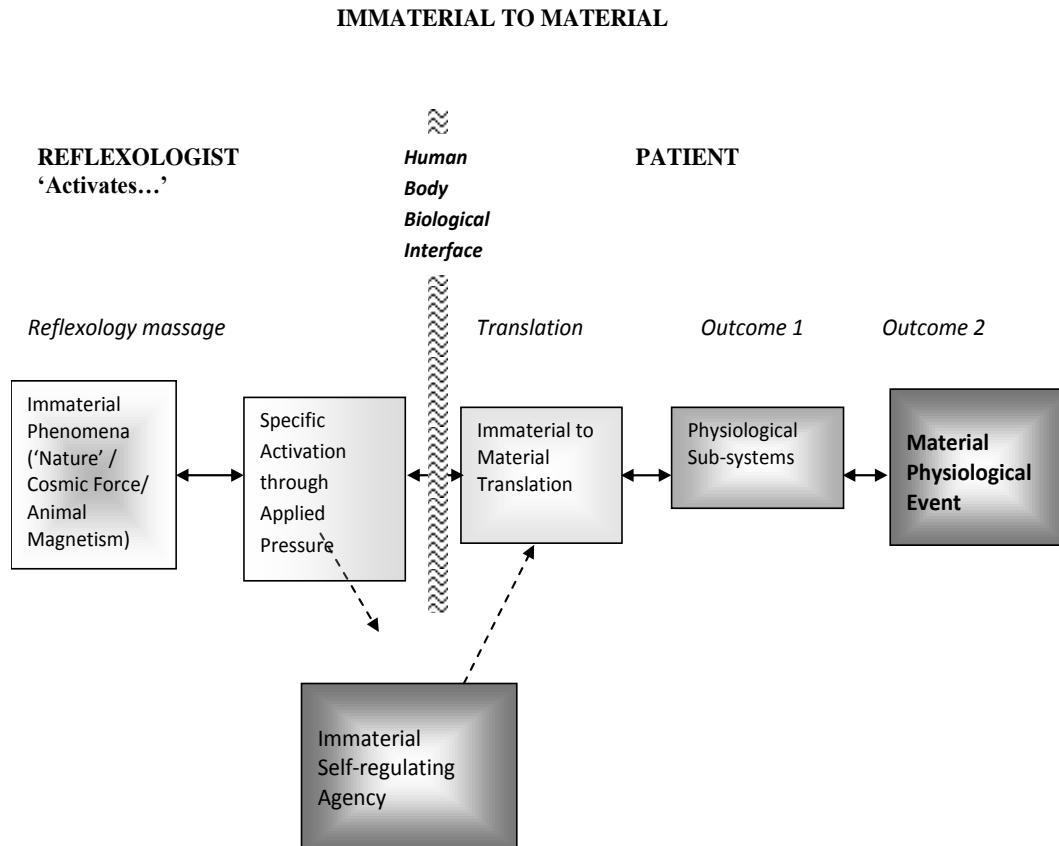


Figure 8. Schematic illustrating Ingham's hypothesised immaterial phenomena of action, operating via unknown interface - interacting with patient's physiological matter.

### “Stories the Feet Have Told” (1951)

In her second book, Ingham seems to have re-interpreted her original notions of healing agency as an intangible etheric form in the body, and now described this healing energy as ‘electro-mechanism’, with the reflex points in the feet said to be acting as terminals for the flow [61]. In a chapter entitled “Terminals”, she made an analogy between her hypothesised reflexes and the ‘terminal’ ends of the arteries, where they transform into veins, speculating that ‘blockages’ impeded the beneficial conduction of the electrical forces of the earth into the feet terminals [62]. Ingham still continued to evoke notions of ‘nature’ as a self-regulating agency but it is unclear whether she now believed ‘electro-mechanism’ was nature itself, or nature made manifest as a definable entity, or “*God's great infallible laws of nature*” [63;64]. Whatever her interpretation of its essence, she continued to move back and forth between concepts [61;65].

Although she presents her findings as fact throughout her two books and uses the word ‘science’ to describe reflexology on several occasions [66-68], Ingham had little awareness of the conditions necessary to scientifically justify claims of knowledge. She offered no experimental evidence except for her series of self-reported case studies. On this basis, her view that the theory of reflexology could be guaranteed by nothing more than a series of

unfalsifiable conjectures and a finite number of observations which partially depended on appeals to immaterial properties for causality, raises questions about how she distinguished science from metaphysical forms of belief such as faith healing. Furthermore, like Fitzgerald, she appeared to have made no efforts to control for errors such as suggestibility, placebo, simple regression to the mean, misdiagnosis or spontaneous recovery as potential confounding factors in her interpretation of her treatment results [48], even though she herself acknowledges the role of suggestibility in disease causality [67].

### **Therapeutic Technique in Relation to Treating Patients with Various Degrees of Heart Disease**

In her first book, Ingham described the anatomy of the heart, and then discussed the effects of ‘congestion’, which can be interpreted to be related to coronary artery disease. She suggested that any tenderness in the heart reflex zone area (located in the upper half of the left foot in her construct), was evidence of congestion in the arteries and veins surrounding the heart, which she proposed would eventually lead to life-threatening clots. She asserted that the heart must be

“... flushed with the proper blood supply, which you will be able to give it by freeing these nerve endings of all acid or calcium deposits where there is a tender reflex” [69].

She recommended that practitioners work the heart reflex area gently at first (if tender), but advises that they return to work on it two or three times during the treatment session, implying that more treatment is better than less. In cases of Angina Pectoris, she claims to have treated a number of cases very successfully and advised the following treatment strategy —

“... if the pain extends up toward the shoulder and neck, work up towards the root of the fourth and fifth toes. Keep trying until you find the tenderness, then set to and work it out...you must work on the foot according to the location the pain around the heart. If the pain extends down toward the arm, work around the base of the little toe, as pointed out and directed for trouble in the shoulder. Since it is certain no harm can be done by working on a reflex, there is no need to hesitate, but set out and do all the good that can be accomplished” [69]

This clearly implies that she sees no harm in working the heart reflex area even in the presence of any gradation of heart disease. Furthermore, it appears that repeated work to the area during a treatment session is advised. In her second book, she refers to calcification of the arterial vessels as the key cause of high blood pressure, and cites the primary cause as faulty ‘elimination’ or tension often found following a ‘distorted mental attitude’ or ‘mental stress’ (although it is not clear whether she relates the calcium involved in hypertension to be the same calcium involved in her crystalline toxic deposit law). However in this book, she offers no direct treatment strategy for either, save for adopting a more cheerful countenance.

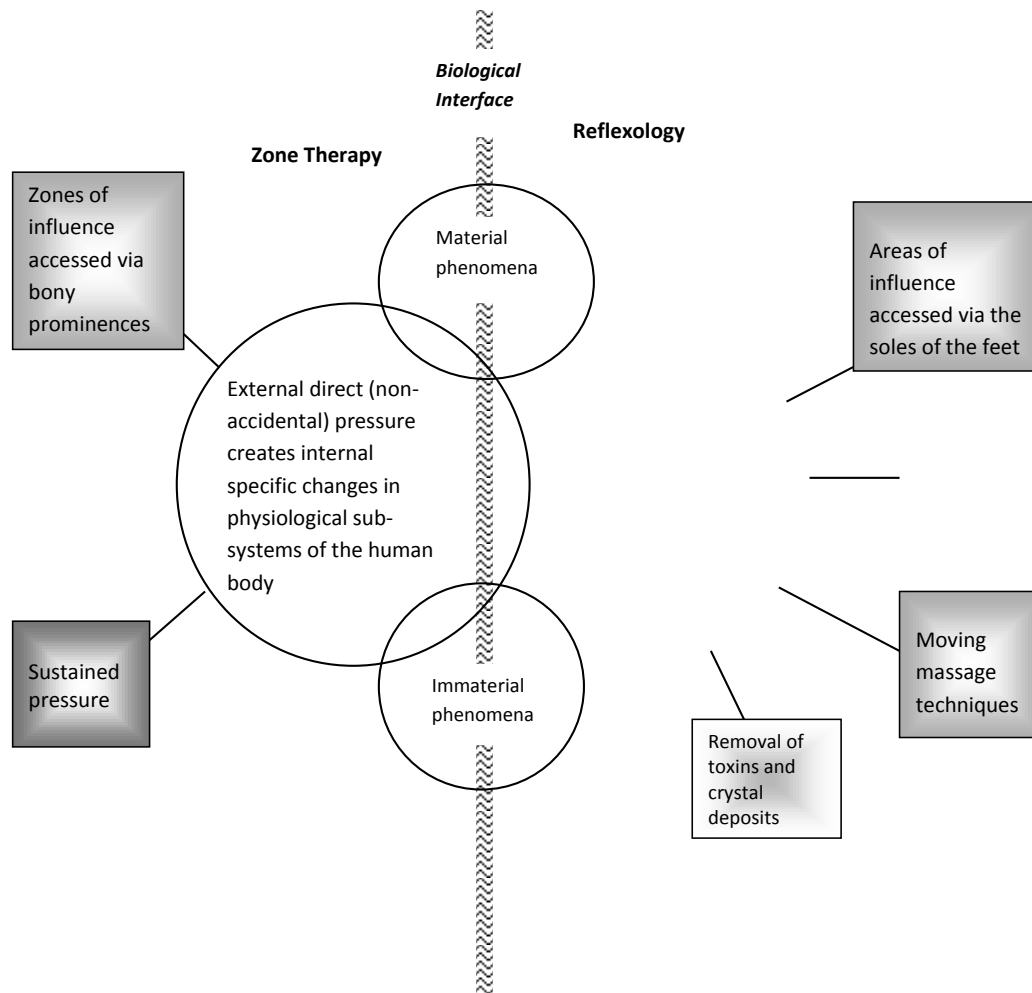


Figure 9. Schematic illustrating Fitzgerald's and Ingham's shared and separate concepts.

## SUMMARY OF DIFFERENCES AND SIMILARITIES BETWEEN THE TWO THEORIES

Although there are some overlapping concepts between the two models, the operational and theoretical principles of each differ in substantial ways (Figure 9).

Both authors came to believe that a specific causal link existed between the application of direct (non-accidental) pressure techniques, and changes in the human condition, that are not normally biologically and causally linked with direct (non-accidental) pressure and second, the appeal by both to immaterial forces (including God) for causality. However, even in these two shared principles, there appears to be substantial differences in interpretation. Fitzgerald believed that the specific effect was evoked through sustained, prolonged pressure on the peripheral finger digits, the tongue and at other times, the soft palate. Whereas Ingham operationalised her effect through unique moving massage therapy techniques delivered to the soles and ankles of the feet. If she involved the hands at all, she used the palms, not the digits.

She also proposed that the human body was somehow biologically mapped to the soles of the feet and invoked notions of toxins and discreet individual feedback loops of circulating blood between distinct areas of this map and individual corresponding organs as necessary components in this construct. Whereas Fitzgerald saw a broader body-wide zone-region construct, with no mention of discreet feedback loops or toxins. In fact, it seems that the only truly shared concept between the two models is the rather vague idea that necessitating causal links exist between the considered application of any form of pressure (be it moving massage or sustained), and specific beneficial changes in the human condition, which are not normally biologically and causally linked with any form of direct (non-accidental) pressure. However as the analysis indicated, neither author made any attempt to explain how ‘directed’ pressure as such could be differentiated between the normal physical pressure experienced in daily activities such as chewing, eating food which the tongue physically manipulates, standing (pressure on the back/sacral area), sitting (same), leaning against objects (pressure on relevant body area), walking (pressure on most areas of the soles of the feet), wearing clothes (shoes, belts, collars, etc), picking up objects (pressure on finger pads, palms etc), feeling things (same), etc. Ingham very briefly mentioned ill-fitting or constricting shoes leading to impediment of circulation in that corresponding reflex area [51], but again, did not distinguish how her directed (non-accidental) pressure evoked a powerful positive healing response in the distal regions of the body whereas the accidental pressure applied by an ill-fitting shoe did not.

## **TREATMENT STRATEGIES AND THEORIES FOR CARDIAC PATIENTS**

Both authors differ regarding treatment strategies for patients with various gradations of heart disease. As the analysis showed, Fitzgerald made no specific recommendations for treating cardiac disease; therefore the reflexology literature inconsistencies quoted in the chapter introduction would appear to have their origins in Ingham’s work. Her law for treating patients with any gradation of heart disease can be categorised as a ‘*no therapy specific risk*’ belief. In other words, she saw no harm in working on a reflex, regardless of the disease state of the corresponding organ. And even though her explanation of causality involved ideas of breaking up ‘blockages’ in the circulatory feedback loop system, she seemed to distinguish the desired intentional goal of dissolution of circulatory ‘blockages’ from the potentially hazardous biological interpretation which suggests dislodgement or break-up of a blood clot, which could then turn into a potentially life-threatening circulating embolus. In the case of treating the heart reflex area on cardiac patients, this would seem to suggest a product safety concern in Ingham’s highly popular commercial model, as over 2% of post-myocardial infarction (MI) patients present with clinically evident systematic embolisms and over 60% of patients with a large anterior MI have an increased risk of embolic thrombus [70], however she makes no reference to this increased risk amongst the cardiac patient population. This implies that she did not regard the ‘blockages’ as being material in nature, which seems somewhat inconsistent with other laws in her belief model, as she also proposed that the blockages (in the form of crystalline toxic deposits) were palpable on the soles of the feet.

## **IDENTIFICATION OF WHAT IS EXPERIMENTALLY FALSIFIABLE IN RELATION TO THE REFLEXOLOGY HAEMODYNAMIC EFFECT**

Ingham consistently described the specific haemodynamic phenomenon in vague ways, lacking any clarity or detail as to the physical nature or biological scope of the effect, apart from fuzzy ideas that ‘nerve’ blockages impede blood circulation in the distinct feedback loop and removal of these blockages enables the corresponding organ to get “*a fresh supply of blood*” [52]. However the falsifiable condition in her theory is the idea that each organ of the body is part of a specific feedback loop which when activated, enables the relevant organ to receive ‘more blood’. Regardless of the fact that the underlying causal mechanisms Ingham appeals to rely on unfalsifiable material and immaterial explanations of causality which include appeals to God, the outcome of a specific haemodynamic effect is a proposition that is experimentally testable.

## **EVIDENCE FOR THE HAEMODYNAMIC CLAIMS**

Based on the idea that the specific haemodynamic effect is a proposition that can be tested, we performed a systematic evaluation of existing reflexology RCT’s to determine whether there was any evidence to suggest the existence of a specific reflexology haemodynamic effect and if so, how it had been experimentally demonstrated? We identified only 48 randomised controlled trials of reflexology in the world literature available as full text [71]. Of these only 12 trials reported the effect on cardiac or vascular parameters [72-81]. However ten of the 12 studies delivered reflexology as a whole treatment, often using foot massage as a control treatment. Therefore it was not possible to determine the existence of any specific haemodynamic component in the therapy due to the fact that foot massage may have ‘contaminated’ the control by accidentally ‘hitting’ or massaging reflex points during the foot massage. Only two trials attempted to investigate the impact of touch as compared to the whole reflexology treatment. i.e. only two attempted to control for other non-specific effects of the therapy and in both cases, although the experimental methods were not entirely robust, their findings suggested the presence of a specific haemodynamic effect that was distinct from the non-specific effects generally associated with foot massage [80;81].

The results of the literature search confirmed that there was a clear need for research using a more innovative design and robust methods which could allow a specific haemodynamic effect to reveal itself, in order to provide high quality evidence to enable cardiac patients users to make a more informed decision about the safety and product quality of the haemodynamic claim. Overall, the literature findings highlighted three key methodological challenges that reflexology research designs need to overcome in order to be considered robust and reliable:

1. How to overcome the issue of inconsistent reflexology foot maps?
2. How to develop a simple standardised reflexology intervention?
3. How to devise a suitable form of control?

## **REFLEXOLOGY RESEARCH CHALLENGES**

As we found a lack of rigorous evidence, we attempted to meet the research challenge of isolating a specific haemodynamic effect ourselves. First, in order to overcome the challenge of the variation in reflexology foot maps, we selected one reflex point for testing purposes to see if reflexology massage to this particular point would specifically affect the haemodynamic status of the corresponding mapped organ. Given the reflexology product safety concerns amongst the cardiac population, it seemed appropriate to pick the heart reflex point itself in order to determine whether causal links exist between the application of reflexology massage techniques to the heart reflex point and specific beneficial changes in the haemodynamic status of the heart. However, before attempting to design a reflexology intervention, we looked for guidance from the contemporary reflexology teaching literature in order to answer the following questions:

1. Do contemporary reflexology theorists and educators consider reflexology to be appropriate and safe for cardiac patients?
2. If so, what are the recommended heart reflex point treatment strategies for patients with cardiac disease?

To answer these questions, the dominant professional reflexology organisations and key commercial training providers were identified, so that only authorised and recommended versions of teaching material would be referenced.

## **ACCREDITED REFLEXOLOGY TEACHING LITERATURE**

In line with many CAM therapies, reflexology is moving towards a more standardised training and educational structure. Professional reflexology training programs changed as a result of the House of Lords Select Committee report on CAM (2000), the Kings Fund Report (2008), Professor Stone's voluntary regulation proposals and the Federal Working Group recommendations [16;82-84]. The outcome of these enquiries led to the Complementary and Natural Healthcare Council (CNHC) being set up to regulate professional standards for a UK-wide voluntary register of CAM practitioners [85]. The CNHC aim is to protect the public by ensuring that CAM registrants meet minimum practitioner quality and product safety standards in their practice and the Department of Health recommend that the public use CNHC registered practitioners wherever possible [86]. Suitably qualified reflexologists are currently eligible for entry to the CNHC Register if they have completed a validated programme of education and gained professional registration status which meets the CNHC requirements [87]. If the practitioner applies for CNHC registration, they are obliged to continue a set amount of professional development training every year. Membership of the CNHC means that the reflexology profession is more open to public scrutiny, but at the same time, it is a form of guarantee to the public that the reflexologist has achieved an approved level of training and this training has been recognised as being of professional standard. Registration of the CNHC is voluntary at this time, but it is generally assumed that membership will become mandatory in due course.

The CNHC currently recognises three professional reflexology associations in the UK which exist to represent the interests of professional reflexologists. These are the British Reflexology Association (BRA), the International Federation of Reflexologists (IFR) and the Association of Reflexologists (AoR). These member associations sit within the larger Reflexology Forum council, a top-level organisation which operates as a voluntary overall regulator of the profession. In 2004, in line with the CNHC requirements for standardisation of training, the Reflexology Forum developed a set of common standards for the practice and training of reflexology. These standards now form the “core curriculum” of reflexology training and are based on the National Occupational Standards set down by the Skills for Health Council. The curriculum, called the “Level 3, 7 Unit Reflexology Practitioners Diploma” consists of 7 pre-defined modules [88]. This modular core curriculum was adopted by all the major accredited reflexology training providers and recognised by CAM/health and beauty vocational awarding bodies, such as City & Guilds, VCTC, ITEC and ABC Awards [88-90]. Reflexology students must meet all the seven module requirements, gain a current first aid certificate and have professional indemnity insurance to be eligible to join the AoR or IFR, although there is no professional obligation to maintain the first aid certification after graduation. BRA membership criteria differs in that they only offer membership to those practitioners who have successfully completed the bespoke Eunice Ingham training at one of the International Institute of Reflexology training centres. However completion of the core curriculum is not a mandatory pre-requisite for professional practice; any person can set up business as a professional reflexologist and operate without professional member or accredited status, regardless of the standard, length or quality of their training.

## THE CORE CURRICULUM READING LIST

The Reflexology Forum’s core curriculum has a recommended reading list of 29 original teaching texts published on the forum website. When the list was searched for available publications, many of the books appeared to be out of print or no longer available, except as second-hand versions. However five of the most popular available teaching texts were still available (excluding the original historical Ingham book). Based on this available sample, the views of the authors of these five books provided a ‘snapshot’ of what contemporary reflexology educational theorists believe about the appropriateness of reflexology for cardiac patients and what was considered to be the best strategy for treatment of the heart reflex point.

## ANALYSIS OF TEACHING TEXTS

The strategy chosen to analyse the responses of each author was to categorise each according to whether their advice constituted a ‘*therapy specific risk*’ belief (implying that reflexology treatment applied to cardiac patients or applied directly to the heart reflex point could have potential adverse/harmful effects) – or like Ingham displayed, a ‘*no therapy specific risk*’ belief (implying that cardiac patient and heart reflex point treatments were

considered safe/beneficial). The following five key teaching and theoretic texts were examined using these criteria.

### **“Reflexology Today” by Doreen Bayley**

Bayley was a nurse who studied with Ingham and is generally accredited with bringing Ingham's version of reflexology to the UK. She states that reflexology can be of great use in helping various heart conditions; however this recommendation comes with caveats. She advises that the method of treatment should be varied according to the nature of heart trouble, and her claims clearly imply that she believes the heart reflex point to have particularly ‘potent’ effects on the heart itself. She describes a case where overstimulation of the heart reflex point led to the person having to spend a week in bed recovering. And in the event of a subject (receiver) experiencing a ‘heart attack’, she states that the therapist should set to work on the heart reflex area found in the left foot as quickly as possible. She states that the impulse effect of this single action has been known to successfully resuscitate many deceased heart attack victims. In cases where the receiver has tachycardia, Bayley also gives a cautionary warning that the therapist should give a general relaxation treatment before approaching the heart reflex point. Her rationale being that if treatment is given to the heart reflex point first, it may adversely increase the elevated pulse rate further. In the case of older subjects with any form of chronic heart disease, Bayley recommends proceeding with caution, advising that the therapist only works for a few minutes on the heart reflex point at first, and only increases the intensity of treatment once the patient has relaxed [91]. Given the caution she advises with regards to treatment of both cardiac patients and the potency she ascribes to the heart reflex point use, it seemed appropriate to categorise Bayley's approach as a ‘therapy specific risk’ belief in relation to treating cardiac patients and/or the heart reflex point.

### **“Reflexology: A Better Way to Health” by Nicola Hall**

Hall states that the heart reflex point is an important area to work in all cases of heart or circulatory disease [92] and that when any reflex area is worked, there is an increase in the blood circulation to the corresponding organ [93]. More specifically, she claims that reflexology can successfully treat “angina, heart attack, hypertension hypotension...and thrombosis” and for all these conditions, lists the heart reflex point as the key point to work [94]. However she strongly recommends care to be taken when treating the heart reflex area in clients with chronic heart disease due to the risk of “over-stimulating” the heart itself [94]. No clear explanation is given of the over-stimulation process. Based on her cautionary approach to treatment of the heart reflex point in cardiac patients and the potency she ascribes to the heart reflex point use, it seemed appropriate to categorise Hall's approach as a ‘therapy specific risk’ belief in relation to treating cardiac patients and/or the heart reflex point.



**“The Complete Guide to Foot Reflexology” by Kevin and Barbara Kunz**

The authors appear to have no concerns about treatment to the heart reflex point or clients with any gradation of cardiac disease. They specifically disregard what they describe as the ‘myth’ that reflexology can cause a “heart attack”, stating that reflexology is “totally safe” [95]. They recommend treating both the heart reflex point and lung area in the event of “heart attacks”, along with the sigmoid colon reflex point (in case pocketing of gas has caused the increased pressure on the chest cavity). In cases of angina, they advise treating the heart reflex point “thoroughly”. This same confident technique is advised for treating hypertension, except that the solar plexus, kidney and adrenal points are indicated rather than the heart reflex point. Again, the authors stress that reflexologists should work the relevant areas repeatedly and thoroughly to reduce blood pressure. Given that the authors advise no caution when treating cardiac patients and regard reflexology treatment as totally safe for all disease conditions, their approach was categorised as a ‘no-therapy specific risk’ belief in relation to treating cardiac patients and/or the heart reflex point.

**“Reflex Zone Therapy of the Feet: A Textbook for Therapists” by Hanne Marquardt**

The author advises caution in treating the heart reflex area and states that it is better to treat the indirect reflex areas rather than the heart point itself. She cites deep vein thrombosis and an aneurysm (if known) as absolute contraindications. For treatment of the heart, the guiding treatment principle is stated as “Depress hyper-excitability and stimulate flaccidity”, with “weak stimuli” being seen as beneficial and “strong stimuli” as “detrimental”, and “very strong stimuli” as “harmful”. The author stresses that this principle of caution, particularly in relation to overstimulation, applies particularly to patients with heart disease [96]. Based on her cautionary approach to treatment of the heart reflex point general and the potency she ascribes to the heart reflex point use, Marquardt’s approach was categorised as a ‘therapy specific risk’ belief in relation to treating cardiac patients and/or the heart reflex point.

**“Complete reflexology: Therapeutic Foot Massage for Health and Wellbeing” by Inge Dougans**

Although Dougans states that reflexology can do no harm, she advises caution when clients present with thrombosis as she believes treatment could cause the blood clot to move [92]. However she does not offer any cautionary advice regarding treatment techniques to the heart reflex point and there is no indication or contra-indications given in regard to clients with cardiac disease. As the author does not offer any objection to treating cardiac patients and regards reflexology treatment as totally safe for all disease conditions apart from diagnosed thrombosis, her approach was categorised as a ‘no-therapy specific risk’ belief in relation to treating cardiac patients and/or the heart reflex point.

Given the haemodynamic nature of the core reflexology claim and the continuing importance of these five key teaching texts from the validated recommended reading list, the lack of consensus regarding the appropriateness of reflexology treatment for cardiac patients, particularly in relation to treatment of the heart reflex point itself, was identified as a product safety and quality issue and a significant research challenge. As will be explained shortly, we attempted to address this challenge in our experimental design.

Apart from the variation in teaching content, the other identified product quality issue from contemporary reflexology teaching literature was the variation in published reflexology foot maps. Rather surprisingly, given the central importance of the therapeutic claim of a specific two-way connection between distinct areas of the feet and increased perfusion of the ‘mapped’ internal organs, the vast majority of published reflexology maps did not appear to exhibit any consensus about where the various reflex points on the feet are. Many different reflexology foot charts were found to be available, ranging from foot maps arbitrarily produced by individual therapists based on their own personal beliefs, right through to maps published and marketed by the Association of Reflexologists [97], the British Reflexology Association [98] and the British School of Reflexology [10]. Most maps appear to have their origins in the original Ingham map [99] but many of the organ-related reflex points on subsequent maps appear in inconsistent places, depending on the beliefs or constructs of the map provider. This inconsistency of published maps presented a significant research challenge in terms of how to identify the ‘correct’ heart reflex point location and standardise a treatment strategy for this point.

## REDUCTIONIST REFLEXOLOGY TREATMENT

We attempted to overcome the challenge of the inconsistent foot maps and heart reflex point location by developing a novel reductionist reflexology treatment for use as both the active intervention treatment and the control (passive) treatment. With the help of the Association of Reflexologists and the two therapists involved in the study, two forms of treatment were devised for use as the intervention and control. The treatments took account of both the ‘*therapy specific risk*’ belief and ‘*non-therapy specific risk*’ belief by being timed to last just five minutes, with pressure of massage treatment set at ‘medium’ only. Both consisted of the same number of common, documented reflexology touch techniques, the only difference being that the intervention and control treatments were applied to two different areas of the feet.

As our aim was to isolate the specific effect corresponding with reflexology massage to the heart reflex point area, we proposed a model where reflexology applied to the top part of the foot above Lesfranc’s line, served as the ‘heart’ reflex point area, which made it the active intervention. We believed this strategy to have model validity in terms of the reflexology construct, as the heart reflex point appeared to be consistently placed in the region on either foot above this line. We assumed that if a standardised reproducible set of reflexology therapy massage techniques were applied to this area on both feet, regardless of the imprecise location of the actual heart reflex point, the therapists would, at some point during the treatment to both upper areas, ‘hit’ or treat the point. Whereas treatment to the feet below the Lefranc’s line should result in nothing more than the typical non-specific effects seen with general foot

massage, therefore this treatment could act as a passive form of reflexology control. We also believed that this model would overcome the other reflexology research challenge, which is that of establishing an appropriately passive form of control that offers a suitable form of comparison with the active intervention.

Our experiments took the form of a randomised, double-blinded repeated measures trial design, where both the volunteer subjects and data collector were blinded as to the treatment types. During the study, the therapists delivered the active treatment (applied to the upper foot areas) and the passive control treatment (applied to the lower heel area of both feet) to 16 healthy volunteers. All subjects were reflexology-naïve and were allocated to receive either treatment at one of two visits, depending on which treatment they had been assigned to. In order to measure the objective haemodynamic effects of treatment to the heart reflex point, the volunteer subjects were attached to impedance cardiography recording equipment throughout each session (using the Task Force © Monitor). Data was continuously measured from a number of selected cardiovascular data pre, post and intra the treatment sessions. It was hoped that this reductionist treatment design meant all the inherent non-specific effects present in general foot massage would be present in both the intervention and control treatments, allowing any haemodynamic effect on the heart to reveal itself during the 'active' treatment alone. The findings of our experiment revealed an inexplicable cardiovascular effect during the healthy volunteer active treatment sessions. For this group, cardiac index decreased significantly during the left foot 'active' treatment. Furthermore, in this experimental condition, there was a trend towards an increase in total peripheral resistance during the active treatment and a reduction in heart rate when this particular area was being treated, a trend which was not evident in any of the control treatments or when the upper half of the right foot was being treated. Intriguingly, most of the published foot maps, including Ingham's original map, places the heart reflex point somewhere in the left upper foot region. On the basis of these findings, it is tantalising to speculate that our study did reveal a specific haemodynamic effect, as our results suggest that reflexology applied to the upper part of the left foot corresponds with a modest but measurable effect on selected cardiovascular parameters in healthy volunteers. The change in cardiac index indicates that further research is needed to determine if this effect is repeatable in patients with various degree of heart disease and if so, if the effect beneficial or potentially harmful in this patient group.

## **FUTURE RESEARCH DIRECTIONS**

It is clear that there is a lack of data to inform patients, health care providers and funders as to the appropriateness of reflexology therapy in cardiac patients. And a lack of data which makes cost effectiveness analysis possible. However regardless of the significant inconsistencies in its historical narrative and contemporary teaching literature, and the lack of supportive evidence for efficacy [12;100;101], reflexology has gained exceptional worldwide acceptance and is currently used by thousands of healthy people and patients. The use of complementary and alternative therapies in western industrialised countries, even with well-developed conventional health care systems is substantial, ranging from 10-52% [102-104]. There is therefore clearly a public 'need' for these therapies in the general population. Furthermore, complementary therapies including reflexology are increasingly utilised by

patients with severe medical conditions and in some areas are offered within conventional health care systems. However, there is insufficient evidence on how this should best integrate with conventional health care [105;106] and it seems that when patients use complementary and alternative therapies out with conventional health care services, many do not inform their physician [107;108]. This is a concern if there is potential for interaction, whether for good or bad, between different therapies.

The results of a local survey at our institution indicated that over 9% of patients attending a cardiology clinic purchased reflexology [unpublished data], although its use in patients has been most commonly documented in palliative care [109] and chronic pain [110]. However, cardiac patients are arguably the patients who may have most to gain (or lose) from potential haemodynamic changes (invoked by reflexology) as most cardiac patients have a disease process or drug therapy that specifically alters the body's haemodynamic homeostasis. Although the evidence is lacking in this respect, there does appear to be a high level of patients / client satisfaction with reflexology. However given the lack of robust research in this area, further studies are required to allow the public, patients and healthcare providers to make evidence based decisions on its provision.

## CONCLUSION

Modern reflexology reports its roots from zone therapy. However, we have demonstrated that there are significant inconsistencies between the theoretical claims of William H Fitzgerald, Eunice Ingham and key contemporary reflexology educators. Furthermore, while reflexology has gained international popularity, the modern evidence base to confirm or refute the original claims is lacking. Considering its widespread use in the general population and within patient groups, and based on the findings of our healthy volunteer study, there is a clear need for further quality research in this area to help patients, clinicians and healthcare providers make evidence based decision on the role reflexology should have in modern medicine.

## REFERENCES

- [1] Mackereth PA, Tiran D. *Clinical Reflexology: A Guide for Health Professionals*. Edinburgh: Churchill Livingstone Elsevier; 2002.
- [2] Ingham E. *Perfect health spells perfect feet. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 3-4.
- [3] Hayes J, Cox C. Immediate effects of a five-minute foot massage on patients in critical care. *Complimentary Therapies in Nursing and Midwifery* 2000;6(19):13.
- [4] Hatton J, King L, Griffiths P. The impact of foot massage and guided relaxation following cardiac surgery: a randomised controlled trial. *Journal of Advanced Nursing* 2002;37(2):199-207.

- 
- [5] Bauer BA, Cutshall SM, Wentworth LJ, Engen D, Messner PK, Wood CM, et al. Effect of massage therapy on pain, anxiety, and tension after cardiac surgery: A randomized study. *Complementary Therapies in Clinical Practice* 2009;In Press, Corrected Proof.
  - [6] Ejindu A. The effects of foot and facial massage on sleep induction, blood pressure, pulse and respiratory rate: Crossover pilot study. *Complementary Therapies in Clinical Practice* 2007 Nov;13(4):266-75.
  - [7] International Institute of Reflexology I. *IIR Diploma Course*. 2012. Ref Type: Online Source.
  - [8] IIR IIR. *Branches of the International Institute of Reflexology*. 2012. Ref Type: Online Source.
  - [9] International Institute of Reflexology I. *The nations leading authority*. 2012. Ref Type: Online Source.
  - [10] IIR IIR. *About the IIR*. 2012. Ref Type: Online Source.
  - [11] Singh S, Edzard E. *How do you determine the truth?* Reading: Bantam Press; 2008. p. 16-52.
  - [12] Ernst E. Is reflexology an effective intervention? A systematic review of randomised controlled trials. *Medical Journal of Australia* 2009;191(5):263-5.
  - [13] House of Lords SC. The Individual Disciplines Examined. *House of Lords Select Committee on Science and Technology: Complementary and Alternative Therapies*. 2000. p. 21.
  - [14] NIFAB Nifab. *NIFAB-undersokelsen*. 2007. Ref Type: Online Source.
  - [15] ViFAB KaRCfAMiutMotIaH. *Reflexology*. 2005. Ref Type: Online Source.
  - [16] House of Lords Select Committee H. The Evidence. *House of Lords Select Committee on Science and Technology: Complementary and Alternative Therapies*. HMSO; 2000. p. 45.
  - [17] Rossana HoF. *Hands on Feet Contact & Prices*. 2010. Ref Type: Online Source.
  - [18] Smallwood C. *The Role of Complementary and Alternative Medicine in the NHS: An Investigation into the Potential Contribution of Mainstream Complementary Therapies to Healthcare in the UK*. FreshMinds; 2010.
  - [19] Ernst E, Koder K. An overview of reflexology. *European Journal of General Practice* 1997 Jan 1;3(2):52-7.
  - [20] Robinson N, Lorenc A, Lewith G. Complementary and alternative medicine (CAM) professional practice and safety: A consensus building workshop. *European Journal of Integrative Medicine* 2011;(10):1-6.
  - [21] Lewith G, Jonas WB, \$Walach H. The role of outcomes research in evaluating complementary and alternative medicine. *Clinical Research in Complementary Therapies: Principles, Problems and Solutions*. Edinburgh: Churchill Livingstone; 2002. p. 29-45.
  - [22] Kiat H, Sun Bin Y, Grant S, Hsu-Tung Chang D. Complementary medicine use in cardiovascular disease: a clinician's viewpoint. *Medical Journal of Australia* 2011;(195):11-2.
  - [23] Kunz B, Kunz K. *Reflexology*. 1st ed. Dorling Kindersley; 2010.
  - [24] Ingham E. *Stories the Feet Can Tell Thru Reflexology - Stories the Feet Have Told Thru Reflexology*. Ingham Publishing Inc; 1984.
  - [25] Bayly D. *Reflexology Today*. 3rd ed. Vermont: Healing Arts Press; 1978.

- 
- [26] Marquardt H. *Reflex Zone Therapy of the Feet: A Textbook for Therapists*. 1st ed. Thorsons; 1983.
  - [27] Dougans I. *Complete Reflexology: Therapeutic Foot Massage for Health and Well-Being*. Bath: Element Books; 1996.
  - [28] Hall N. *Reflexology for Women*. 1994. London, Thorsons. 4. Ref Type: Online Source.
  - [29] Bisson DA. Reflexology. In: Frishman WH, Weintraub MI, Micozzi MS, editors. *Complementary and Integrative Therapies for Cardiovascular Disease*. New York: Elsevier Mosby; 2005. p. 331-41.
  - [30] WHO WHO. *World Health Organisation: Traditional Medicine*, Fact sheet no 134. 2012. Ref Type: Online Source.
  - [31] Issel C. *The americans and reflexology. Reflexology; Art, Science & History*. Sacramento, Ca, New Frontier Publishing; 1996. p. 46-81.
  - [32] Bond Bressler H. Introduction. *Zone Therapy*. 2 ed. Richmond, Virginia: Williams Printing Company; 1971. p. 19-32.
  - [33] Fitzgerald WH. *Zone Therapy: For Doctors only. Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917.
  - [34] Fitzgerald WH, Bowers EF. Relieving pain by pressure. *Zone Therapy or Relieving Pain at Home*. New York: Kessinger Publishing Co; 1917. p. 15-23.
  - [35] Fitzgerald WH. Curing Goitre with a probe. *Zone therapy or relieving pain at home. Columbus*, Ohio: I W Long Publisher; 1917. p. 32-41.
  - [36] Fitzgerald WH. Making the deaf hear. *Zone therapy or relieving pain at home. Columbus*, Ohio: I W Long Publisher; 1917. p. 51-9.
  - [37] Fitzgerald WH. *Zone therapy for women. Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917. p. 76-82.
  - [38] Fitzgerald WH. Curing Lumbago. *Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917. p. 93-103.
  - [39] Fitzgerald WH. *Scratching hand for sick stomach. Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917. p. 104-10.
  - [40] Fitzgerald WH. *Hay fever, asthma and tonsilits. Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917. p. 111-9.
  - [41] Fitzgerald WH. *That aching head. Zone therapy or relieving pain at home. Columbus*, Ohio: I W Long Publisher; 1917. p. 25-31.
  - [42] Hall N. *What reflexology is and where it came from. Reflexology for Women*. London: Thorsons; 1994. p. 4-8.
  - [43] Fitzgerald WH. *Introduction. Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917. p. 5-10.
  - [44] Fitzgerald WH. *Zone therapy - mainly for dentists. Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917. p. 148-70.
  - [45] Fitzgerald WH. *Publishers note. Zone therapy or relieving pain at home*. Columbus, Ohio: I W Long Publisher; 1917. p. 11-2.
  - [46] Fitzgerald WH, Bowers EF. *Food for thought. Zone Therapy or Relieving Pain at Home*. New York: Kessinger Publishing Co; 1917. p. 186-91.
  - [47] Connor CD. *Who were the winners in the scientific revolution? A people's history of science; Miners, Midwives and Low Mechanicks*. New York: Nation Books; 2005. p. 404-5.

- 
- [48] Beyerstein BL. Alternative medicine and common errors of reasoning. *Academic Medicine* 2001;76(3):230-7.
- [49] Ingham E. Preface. *Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. ii-iv.
- [50] Ingham E. *Perfect Health Spells Perfect Feet. Stories the Feet Can Tell Thru Reflexology - Stories the Feet Have Told Thru Reflexology*. 1984. p. 3-4.
- [51] Ingham E. Zone therapy. *Stories the Feet Can Tell; Stories the Feet Have Told Thru Reflexology*. 4th ed. 1984. p. 6-7.
- [52] Ingham E. Reflexes present in the hands and feet. *Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 10-1.
- [53] Ingham E. Location of reflexes. *Stories the Feet Can Tell; Stories the Feet Have Told Thru Reflexology*. 4th ed. 1984. p. 12-3.
- [54] Ingham E. *Stories the feet can tell. Stories the feet can tell thru Reflexology; stories the feet have told thru reflexology*. St Petersburg, Florida: Ingham Publishing; 1984. p. 1-2.
- [55] Ingham E. Reactions manifested. *Stories the Feet Can Tell; Stories the Feet Have Told Thru Reflexology*. 4th ed. 1984. p. 8-9.
- [56] Ingham E. Illustration of technique. *Stories the feet have told*. St Petersburg, Florida: Ingham Publishing; 1984. p. 12.
- [57] International Institute of Reflexology I. IIR Training: *Why settle for less than the best?* 2012. Ref Type: Online Source.
- [58] Ingham E. *As compared to a watch. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 45-6.
- [59] Levick J. *Overview of the cardiovascular system. An introduction to cardiovascular physiology*. 5th ed. London: Hodder Arnold; 2010. p. 1-14.
- [60] Ingham E. *Introduction. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. V.
- [61] Ingham E. *Gland reflexes in the feet. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 6-8.
- [62] Ingham E. *Terminals. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 67.
- [63] Ingham E. *To blaze the path. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. -93.
- [64] Ingham E. *Importance of proper circulation. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 104.
- [65] Ingham E. Ingham compression method of reflexology. *Stories the Feet Can Tell; Stories the Feet Have Told Thru Reflexology*. 4th ed. 1984. p. 2-3.
- [66] Ingham E. *An open mind. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 23-4.

- 
- [67] Ingham E. *Mind and digestion. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 97-9.
  - [68] Ingham E. *Don't be hasty. Stories the feet can tell thru reflexology; stories the feet have told thru reflexology*. 11th ed. St Petersburg, Florida: Ingham Publishing; 1984. p. 15.
  - [69] Ingham E. *The Heart. Stories the feet can tell thru reflexology; Stories the feet have told thru reflexology*. 4 ed. St Petersburg: Ingham Publishing Inc.; 1938. p. 43-8.
  - [70] Mukherjee D. Complications of Myocardial Infarction. In: Marso S, Griffin BP, Topol EJ, editors. *Cardiovascular Medicine*. London: Lippincott Williams & Wilkins; 2000. p. 39-56.
  - [71] Jones J, Thomson P, Irvine K, Leslie S. Is there a specific haemodynamic effect in reflexology: A systematic review of randomised controlled trials? *Journal of Alternative and Complementary Medicine*. In press 2011.
  - [72] Gunnarsdottir JT, Helga J. Does the experimental design capture the effects of complementary therapy? A study using reflexology for patients undergoing coronary artery bypass graft surgery. *Journal of Clinical Nursing* 2007 Apr;16(4):777.
  - [73] Frankel BSM. The effect of reflexology on baroreceptor reflex sensitivity, blood pressure and sinus arrhythmia. *Complementary Therapies in Medicine* 1997 Jun;5(2):80-4.
  - [74] Hodgson NA, Andersen S. The Clinical Efficacy of Reflexology in Nursing Home Residents with Dementia. *Journal of Alternative & Complementary Medicine* 2008 Apr;14(3):269-75.
  - [75] Zhen LP, Fatimah SN, Acharya RU, Tam D-WD, Joseph KP. Study of Heart Rate Variability due to Reflexological Stimulation. *Clinical Accupuncture and Oriental Medicine* 2004;(4):173-8.
  - [76] Wilkinson ISA, Prigmore S, Rayner CF. A randomised-controlled trial examining the effects of reflexology of patients with chronic obstructive pulmonary disease (COPD). *Complementary Therapies in Clinical Practice* 2006 May;12(2):141-7.
  - [77] Joseph P, Acharya IR, Kok Poo C, Chee J, Min KC, Iyengar SS, et al. Effect of reflexological stimulation on heart rate variability. *Innovation et technologie en biologie et medecine* 2004;(25):40-5.
  - [78] Mackereth PA, Booth K, Hillier VF, Caress AL. Reflexology and progressive muscle relaxation training for people with multiple sclerosis: A crossover trial. *Complementary Therapies in Clinical Practice* 2009 Feb;15(1):14-21.
  - [79] Mc Vicar AJ, Greenwood CR, Fewell F, D'Arcy V, Chandrasekharan S, Alldridge LC. Evaluation of anxiety, salivary cortisol and melatonin secretion following reflexology treatment: A pilot study in healthy individuals. *Complementary Therapies in Clinical Practice* 2007 Aug;13(3):137-45.
  - [80] Sudemeier H, Bodner G, Egger I, Mur E, Ulmer H, Herold M. Changes of renal blood flow during organ-associated foot reflexology measured by colour Doppler sonography. *Research in Complementary Medicine: Forschende Komplementarmedizin* 1999;(5):129-34.
  - [81] Mur E, Schmidseider S, Egger I, Bodner G, Hartig F, Pfeiffer KP, et al. Influence of Reflex Zone Therapy of the Feet on Intestinal Blood Flow Measured By Color Doppler Sonography. *Forschende Komplementarmedizin und Klassische Naturheilkunde* 2001;(8):86-9.



- 
- [82] Black C. *Assessing complementary practice: Building consensus on appropriate research methods*. The King's Fund; 2009.
  - [83] Stone J. *Development of proposals for a future voluntary regulatory structure for complementary healthcare professions*. The Prince of Wales's Foundation for Integrated Health; 2005.
  - [84] FWG FWG. *A Federal Approach to Professionally-Led Voluntary Regulation for Complementary Healthcare: The final report of the Federal Working Group: A plan for action*. 2008.
  - [85] CNHC C&NHC. *Mission and Values*. 2011. Ref Type: Online Source.
  - [86] CNHC C&NHC. *Why register with the Complementary & Natural Healthcare Council*. 2011. Ref Type: Online Source.
  - [87] CNHC C&NHC. *Criteria for Entry to the CNHC Register*. 2011. Ref Type: Online Source.
  - [88] AoR TAoR. *Am I eligible?* 2011. Ref Type: Online Source.
  - [89] The British Reflexology Association B. *What is Reflexology?* 2010. Ref Type: Online Source.
  - [90] IIR TIFoR. *The International Federation of Reflexologists*. 2012. Ref Type: Online Source.
  - [91] Bayley DE. *The Heart. Reflexology Today*. 3rd ed. Rochester: Healing Arts Press; 1982. p. 31-2.
  - [92] Hall N. *The reflex areas of the feet and hands. Reflexology: A Way to Better Health*. London: Thorsons; 1992. p. 27-91.
  - [93] Hall N. *How the treatment works. Reflexology: A Way to Better Health*. Bath: Gateway Books; 1992. p. 115-22.
  - [94] Hall N. *The treatment of different disorders. Reflexology: A Way to Better Health*. Bath: Gateway Books; 1992. p. 124-57.
  - [95] Kunz K, Kunz B. *You the Reflexologist. The Complete Guide to Foot Reflexology*. London: Thornsons for Harper Collins Publishers; 1984. p. 73-91.
  - [96] Marquardt H. *Treatment Procedures. Reflex Zone Therapy of the Feet: A Textbook for Therapists*. 1st ed. Thorsons; 1983. p. 36-65.
  - [97] AoR TAoR. *AoR Reflexology Chart*. 2011. Ref Type: Online Source.
  - [98] BRA BRA. *Reflexology Foot Chart*. 2011. Ref Type: Online Source.
  - [99] Ingham E. *Stories the Feet Can Tell Thru Reflexology - Stories the Feet Have Told Thru Reflexology*. Ingham Publishing Inc; 1938.
  - [100] Ernst E, Posadzki P, Lee MS. Reflexology: An update of a systematic review of randomised clinical trials. *Maturitas* 2011 Feb;68(2):116-20.
  - [101] Wang M, Tsai P, Lee P, Chang W, Yang C. The efficacy of reflexology: systematic review. *Journal of Advanced Nursing* 2008;62(5):512-20.
  - [102] Eisenberg D, Davis R, Ettner S, Appel S, Wilkey S, Van Rompay M, et al. Trends in alternative medicine use in the United States: Results of a follow-up national survey. *Journal of the American Medical Association* 1998;(280):1569-75.
  - [103] Metcalfe A, Williams J, McChesney J, Patten S, Jetter N. Use of complementary and alternative medicine by those with a chronic disease and the general population - results of a national population based survey. *BMC Complementary and Alternative Medicine* 2010;(10):58-63.

- [104] Thomas K, Coleman P. Use of complementary or alternative medicine in a general population in Great Britain. Results from the National Omnibus survey. *Journal of Public Health* 2004;26(2):152-7.
  - [105] O'Connor E, White K. Intentions and willingness to use complementary and alternative medicine: what potential patients believe about CAMs. *Complementary Therapies in Clinical Practice* 2009;(15):136-40.
  - [106] Featherstone C, Godden D, Selvaraj S, Emslie M, Took-Zozaya M. Characteristics associated with reported CAM use in patients attending six GP practices in the Tayside and Grampian regions of Scotland: A Survey. *Complementary Therapies in Medicine* 2003;(11):168-76.
  - [107] Thomson P, Jones J, Evans J, Leslie S. Factors influencing the use of complementary and alternative medicine and whether patients inform their primary care physician. *Complementary Therapies in Medicine*. In press 2011.
  - [108] Eisenberg DM, Davis RB, Ettner SL, Appel S, Wilkey S, Van Rompay M, et al. Trends in Alternative Medicine Use in the United States, 1990-1997: Results of a Follow-up National Survey. *JAMA* 1998 Nov 11;280(18):1569-75.
  - [109] Rueda J, Sola I, Pascual A, Subirana CM. *Non-invasive interventions for improving well-being and quality of life in patients with lung cancer. 2011*. Report No.: Cochrane Database Systematic Review CD004282.
  - [110] van Tulder M, Furlan A, Gagnier J. Complementary and alternative therapies for low back pain. *Best Practice & Research Clinical Rheumatology* 2005;19(4):639-54.
- .